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# FISHERIES RESEARCH BOARD (OF CANADA)

## Atlantic Biological Station St. Andrews, N. B.

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## Harp Seals of the Northwest Atlantic

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### Distribution and movements:

The following is a brief résumé of the life history and movements of the northwest Atlantic stocks of harp seals (*Phoca groenlandica*) during the course of a year:

July-October - Scattered schools in the Arctic, feeding in waters of west Greenland and eastern Canadian Arctic (see accompanying map).

November-January - Southward migration, splitting at Belle Isle to proceed to areas east of Newfoundland and in the Gulf of St. Lawrence. Active feeding and fattening.

February - Northward movement of adults to whelping ice in mid-Gulf and off southern Labrador. Whelping begins in last few days of month.

March - Majority of females whelp on ice early in month, leave pups two to three weeks after birth, mate with males. Pups moult the white coat near end of month and begin entering water.

April-June - Completion of mating. Adults and immatures from both Gulf and east coast of Newfoundland populations haul out on ice off latter area to moult. Pups drift or swim south into open water, some remaining until mid-May.

Adults and immatures move gradually north in ice, while moulting. Herds widely scattered but by June all usually are north of Belle Isle.

### Two whelping regions:

There are two whelping regions in the northwest Atlantic, one in the Gulf of St. Lawrence and the other off the east coast of Newfoundland or the "Front" (see map). The proportion whelping in the Gulf remains about the same from year to year regardless of whether or not ice conditions are suitable, but whether the two populations are distinct is not yet known. Skull and body proportions are being studied and tagging is being carried out in order to discover the degree of distinctness of the two stocks.

### Reproduction:

Female harp seals generally have been believed to mature sexually at the end of their third year, bearing their first pup at the end of their fourth year. Studies of ovarian corpora lutea (pregnancy scars) in females of known age, however, suggest that sexual maturation for the majority of females is one or two years later. Females can bear young up to the age of at least 16 years, and probably over 20. Of a random sample of 70 sexually mature females taken in January of 1951 and 1952 in the Strait of Belle Isle, 14

or 20 % were not pregnant, suggesting that 80 % of the mature females bear young.

Examination of the bacula or penis bones in a series of males of known age suggests that males do not breed actively until the sixth or seventh year.

### Mortality:

The age composition of a random sample of 375 harp seals of both sexes taken in January, 1952, at La Tabatiere, Quebec Labrador, gives some indication of the rate of total mortality, i.e. kill by industry plus natural mortality. Figures 1-3 are graphs showing the age composition as determined by reading the annual rings laid down in the canine tooth dentine by the pulp cavity (see Laws, 1952). The small size of the first year group, which should be the largest group, having suffered the least mortality, is due apparently to the fact that many animals in their first year do not migrate south with the main body, but remain in Arctic waters. It is not known with certainty whether or not any immature seals older than one year remain in the Arctic in winter, and several years of sampling will be necessary to determine the significance of the increasing size of age groups 2 to 5 in Figure 1. If we take age classes from 5 on, we see that on the whole there is an average annual mortality of about 22 %. This indicated rate of total mortality probably is less than that which normally occurs with an annual kill at the ice, since in the years 1941 to 1946, the take was negligible. The period 1942 to 1945 inclusive in fact represents largely a closed season on sealing. These year-classes have all been subject to killing in the same six years (1947 to 1952). In the graph the decline in abundance from the 1945 to the 1942 year-class must, therefore, be attributed largely to natural mortality. It suggests a natural mortality of not more than 15 %.

It has not been possible as yet to obtain an adequate sample from the Front for comparison, because of difficulties of sampling on the ice and because there is no netting station for migrants on the Front comparable to that at La Tabatiere, which samples Gulf migrants.

The oldest age determined thus far from tooth rings has been 28 years, but ages over 20 are difficult to determine in the teeth and 20 and over are lumped together in the graphs.

### Population estimates from aerial photographs:

Aerial photographic surveys were carried out over whelping patches in the Gulf and on the Front during March of 1950 and 1951. Because of adverse weather which kept the aircraft grounded much of the time, it was not possible to cover completely with photography all whelping patches on the Front before they had been hunted or had broken up. Visual estimates were made for unphotographed portions, and it is believed that 50 % of the Front whelping



population was covered. Aerial exploration was carried out in 1951 over the ice pack from shore to ice edge up almost to Cape Chidley, without discovering further patches of seals. In the Gulf of St. Lawrence the seals are relatively easy to locate and to keep under surveillance, and the coverage here was considered fairly complete.

The surveys were carried out with a long-range aircraft equipped with standard vertical aerial survey cameras. The areas of the herds on the ice were determined, and the photography consisted of taking random strips of vertical overlaps from one end of the herd to the other, at varying altitudes depending on ice and light conditions. In this way the average density of seals per square mile in each herd was determined and applied to the total area of the herd. Because it was impossible to estimate the number of adult seals in the water, population estimates are based largely on the pup count, since the pups remained on the ice during the time of the surveys.

Population estimates, which agreed fairly closely in each year of the survey, gave a figure of about 430,000 for the pup production on the Front, and about half this number, or 215,000, in the Gulf. Taking into account the facts that only one pup is born per female, that about 80 % of mature females bear young, that the sex ratio is equal, and that immatures appear to be equal in numbers to adults in catches by nets, the Front population, aside from the annual crop of 430,000 pups, contains 1,075,000 adults and 1,075,000 immatures, or 2,150,000, and the Gulf population, on the same basis, about half these numbers.

#### Catch Statistics:

The following table, based on records from Chafe (1923), the Newfoundland Fisheries Board and the industry, shows records of the Newfoundland kill of harp seals on the ice, and of the recently developed Norwegian fishery. The figures for the period 1895 to 1945 include seals taken at times in the Gulf of St. Lawrence, but the majority were taken on the Front. The figures from 1946, the first post-war year in which Norway operated in northwest Atlantic waters, refer to the kill in the pack ice on the Front only.

Recent figures for the kill in the Gulf are not yet complete, but it has been averaging about 60,000 per year, almost all pups, since immature and adult animals from the Gulf haul out on the ice with the Front herds for moulting. It should be borne in mind that there is an annual shore-based catch of harp seals in west Greenland of about 50,000 and in Labrador, Quebec, and Newfoundland of about 15,000 which catches are not included in the table.

#### Need for restriction:

Colman (1949) in a review of the Newfoundland sealing up to 1948, concluded that there did not seem to be any immediate danger of over-fishing. Certainly it appears from the figures that the harp seal population is capable of maintaining itself at a rate of killing comparable to that in the 30 years previous to World War II. In post-war years, however, the catch has increased to a level well over this. An important factor to consider, too, is that the proportion of immature and breeding animals in the total kill has increased considerably from an annual average of 8% in 1895-1911, to 16% in 1912-40, to 33% in 1946-1952.

In 1951, from the estimated production of 430,000 pups (aerial survey estimate), 241,000 were taken, as well as 113,000 older seals. This leaves a pup "escapement" of 189,000 which must undergo one year of natural mortality and from two to four years of natural mortality plus human kill, before in turn producing pups. Dorofeev (1939), dealing with the harp seal population in the White Sea, states that observations made on proportions of immature age groups suggest that they occur in the proportions of 28% 3-year-olds, 32% 2-year-olds, and 40% 1-year-olds, indicating a total mortality of 20% from 1 year to 2, and 12½% from 2 to 3. Accurate aging methods were unknown then, however, and the assumption was made that all females matured at the end of their third year, which is not so for the seals on this side. On the basis of an adult and immature stock on the Front of 2,150,000 and an annual natural mortality rate of 15% (suggested above under "mortality"), the numbers dying each year would be over 300,000. It seems obvious that with continuing kill in the order of that in 1951, the population would be unable to maintain itself and some restriction would be needed. While the 1952 kill is down, evidently as a result of difficult ice conditions for the ships, early consideration should be given to the type of restrictive measures needed should there be indications of a sustained hunting effort of the present order. It is hoped that continued research will produce sufficient knowledge of relationships among year classes, mortality rates, ages at sexual maturity and fecundity to make possible reliable estimation of the maximum kill which can be sustained.

#### Protection of older seals:

Consideration of the relative value of pups and adults indicates that the logical place in which to impose restriction is on the killing of older seals. The pup pelt is the one in which industries of both Norway and Canada are chiefly interested, both from the viewpoint of a better quality oil and a more valuable skin. The fast fur of the white-coat probably is worth several times as much as the skin of an old seal. In addition to being more valuable individually than the adults, more than two pups would have to be saved for each breeding seal which resulted, should the killing of young be restricted, natural mortality being very high during the first year.

#### Method of protecting immatures and adults:

The simplest way in which to restrict the kill on older seals is by imposing a closing date early enough to discourage the taking of them by the majority of vessels. The killing of old seals generally starts some time toward the middle of April after the immatures and adults have congregated in moulting patches on loose ice.

Another means of protecting valuable breeding stock would be an agreement not to kill adult females in the whelping patches. Killing of these breeding animals has increased in recent years, and it depletes the most valuable and vulnerable part of the population.

#### References:

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Fig. 1

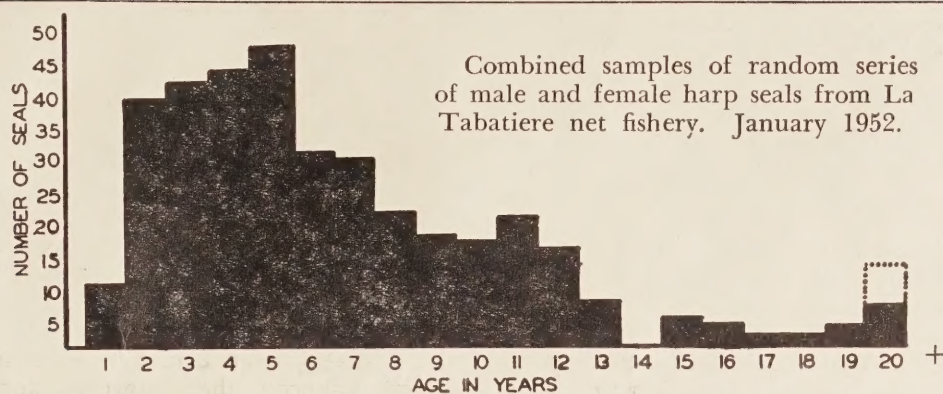


Fig. 2

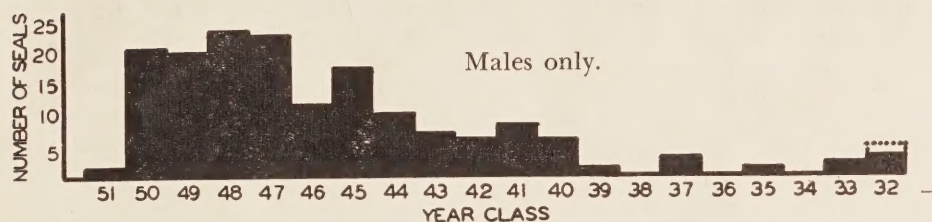
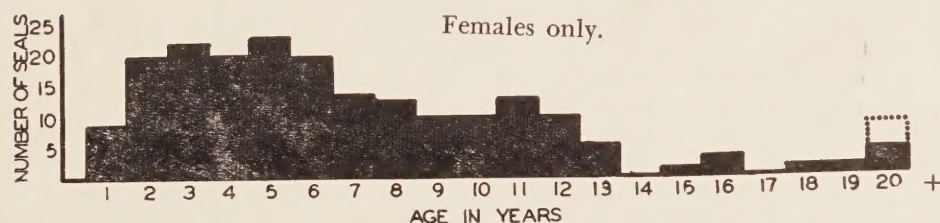


Fig. 3

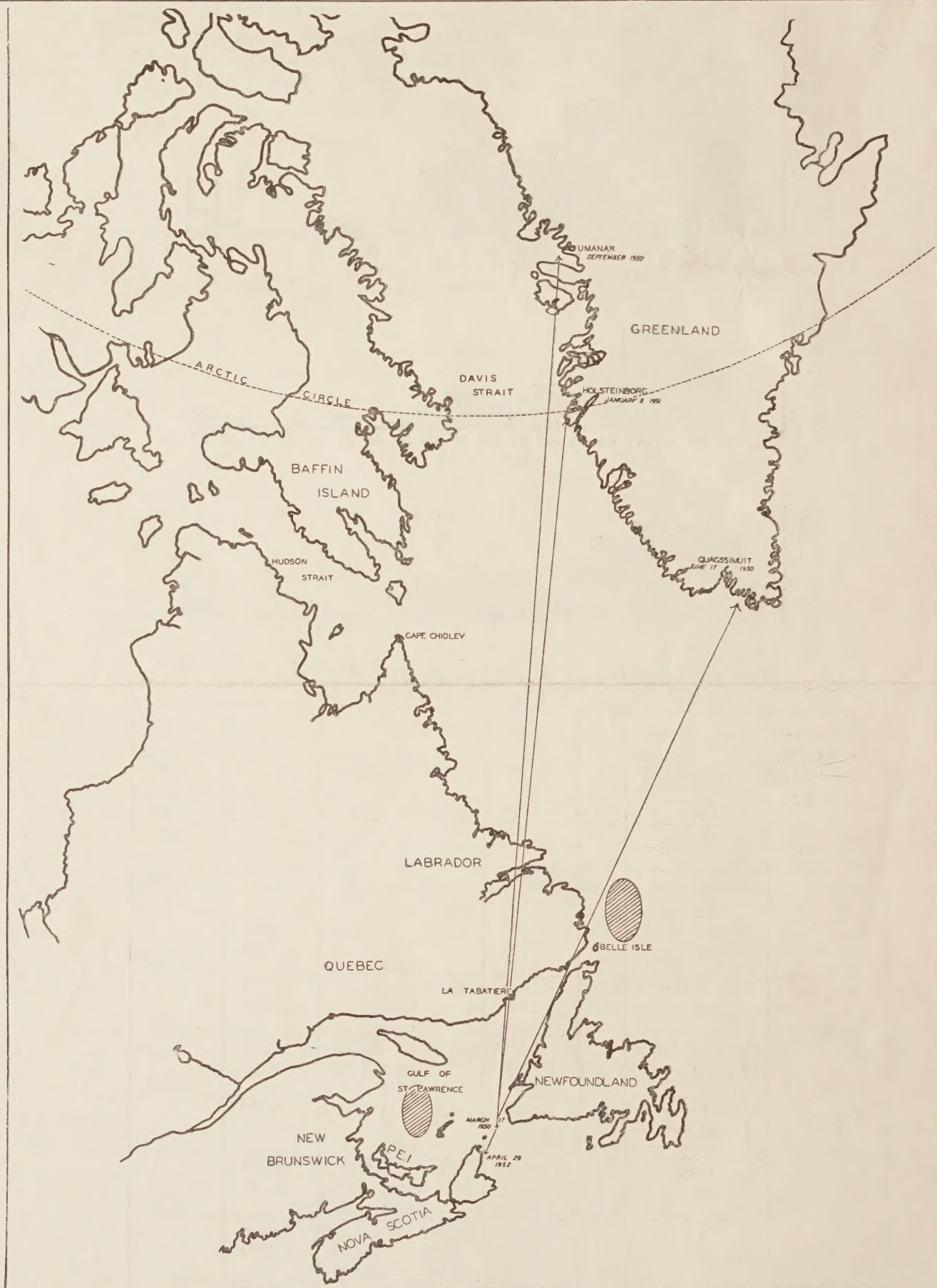


## Harp seals killed on the "Front" (east of Newfoundland and Labrador).

| Year         | Country         | Ships | Pups    | Immatures | Adults | Totals   |
|--------------|-----------------|-------|---------|-----------|--------|----------|
| 1895-1911    | Newfoundland    | 20    | 228,315 | 13,376    | 7,617  | 249,308  |
| Av. per year |                 |       |         |           |        |          |
| 1912-1940    | Newfoundland    | 10    | 134,236 | 19,574    | 5,779  | 159,589  |
| Av. per year | (Norway 1938-9) |       |         |           |        |          |
| 1941         | Newfoundland    | 4     | 16,636  | 20,100    | 5,554  | 42,290   |
| 1942         | Newfoundland    | 2     | 1,723   | 1,566     | 466    | 3,755    |
| 1943         | No sealing      |       |         |           |        |          |
| 1944         | Newfoundland    | 1     | 6,360   | 28        | 50     | 6,438    |
| 1945         | Newfoundland    | 5     | 9,516   | 1,637     | 378    | 11,531   |
| 1946         | Newfoundland    | 12    | 15,635  | 11,017    | 3,426  | 30,078   |
|              | Norway          | 1     | 6,163   | 731       |        | 6,894    |
| Totals       |                 | 13    | 21,798  | 15,174    |        | 36,972   |
| 1947         | Nfld. & Canada  | 17    | 45,618  | 39,725    | 16,363 | 101,706  |
|              | Norway          | 1     | 3,899   | 5,182     |        | 9,081    |
| Totals       |                 | 18    | 49,517  | 61,270    |        | 110,787  |
| 1948         | Nfld. & Canada  | 25    | 69,574  | 34,197    | 23,573 | 127,344  |
|              | Norway          | 4     | 16,376  | 11,104    |        | 27,480   |
| Totals       |                 | 29    | 85,950  | 68,874    |        | 154,824  |
| 1949         | Nfld. & Canada  | 21    | 103,280 | 14,503    | 12,775 | 130,558  |
|              | Norway          | 8     | 38,774  | 17,677    |        | 56,451   |
| Totals       |                 | 29    | 142,054 | 44,955    |        | 187,009  |
| 1950         | Canada          | 6     | 69,130  | 8,874     | 3,323  | 81,327   |
|              | Norway          | 13    | 76,949  | 15,506    |        | 92,455   |
| Totals       |                 | 19    | 146,079 | 27,703    |        | 173,782  |
| 1951         | Canada          | 12    | 169,000 | 25,992    | 25,546 | 220,538  |
|              | Norway          | 11    | 72,240  | 5,952     | 55,812 | 134,004  |
| Totals       |                 | 23    | 241,240 | 31,944    | 81,358 | 354,542  |
| 1952         | Canada          | 11    | 67,621  | 6,731     | 10,510 | 84,862   |
|              | Norway          | 9     | *53,000 | *60,000   |        | *113,000 |
|              | France          | 1     |         | 77,241    |        | *7,000   |
| Totals       |                 | 21    | 120,621 |           |        | 204,862  |

\* Round Figures





Map showing major part of range of northwest Atlantic harp seals. Shaded areas are approximate sites of whelping patches when first formed. Arrows point from tagging site of 125 white-coat pups in March, 1950, to sites and dates of recoveries.